



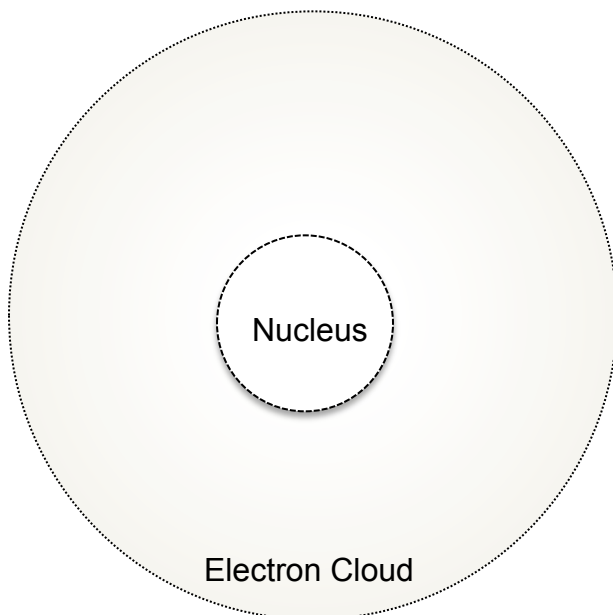
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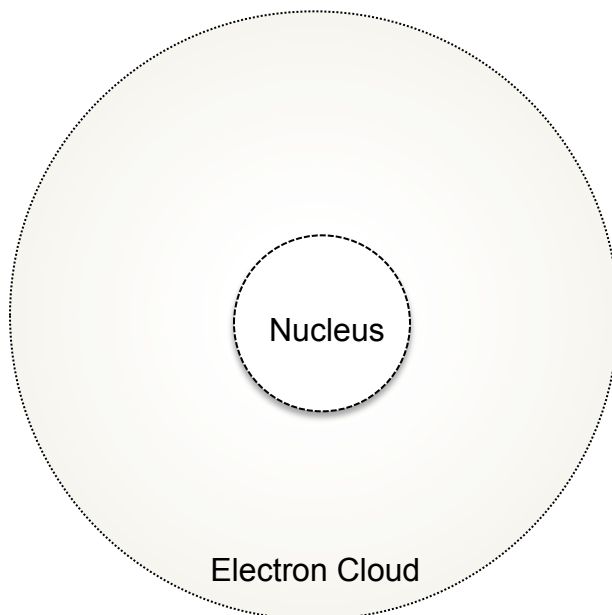
The Atom

Part I: Modeling Atoms

Hydrogen Atom



Helium Atom



| Key | |
|--------|--------------------|
| Symbol | Subatomic Particle |
| | Proton (p^+) |
| | Neutron (n^0) |
| | Electron (e^-) |

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Part I: Modeling Atoms, continued

1. Fill in the data table: Properties of Subatomic Particles below.

| Properties of Subatomic Particles | | | |
|-----------------------------------|------------|-------------------|-------------|
| Subatomic Particle | Symbol () | Electrical Charge | Mass in AMU |
| Proton | | | |
| Neutron | | | |
| Electron | | | |

2. Where is the mass of an atom found? Explain.

3. Look at the diagrams to determine what contributes the most to the volume of an atom, the nucleus or the electron cloud? Explain.

4. Since protons (p^+) with a positive charge and neutrons (n^0) without a charge are located in the nucleus, what is the overall charge of the nucleus portion of an atom: positive, negative, or no charge at all? Explain.

5. What is the overall charge of the electron cloud of the atom? Explain.

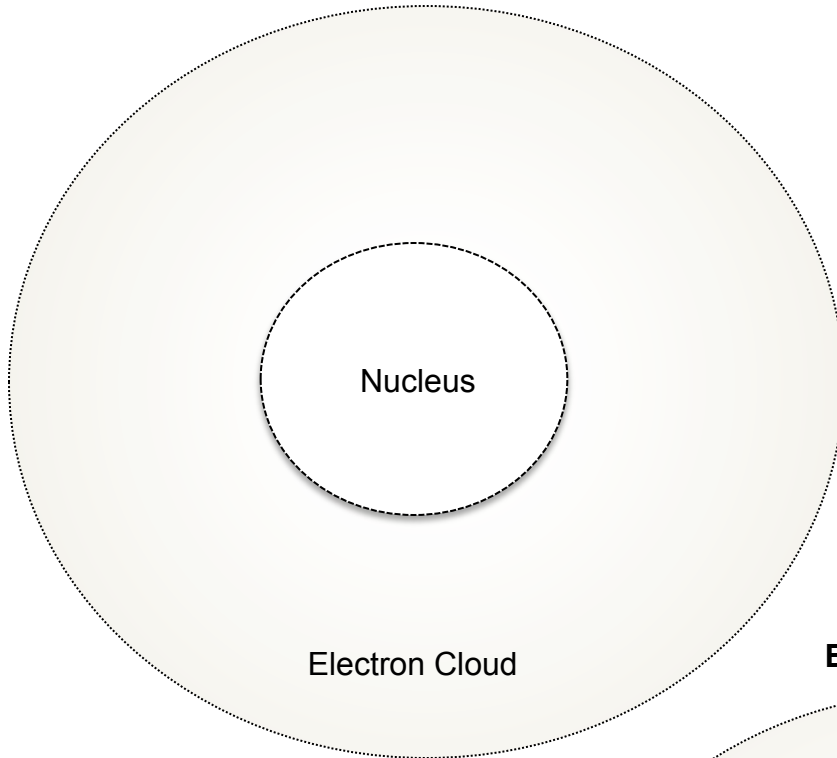
6. What similarities do you see when comparing the hydrogen atom diagram to the helium atom diagram?

7. Compare the numbers of each subatomic particle found in both diagrams, and then list what makes hydrogen different from helium.

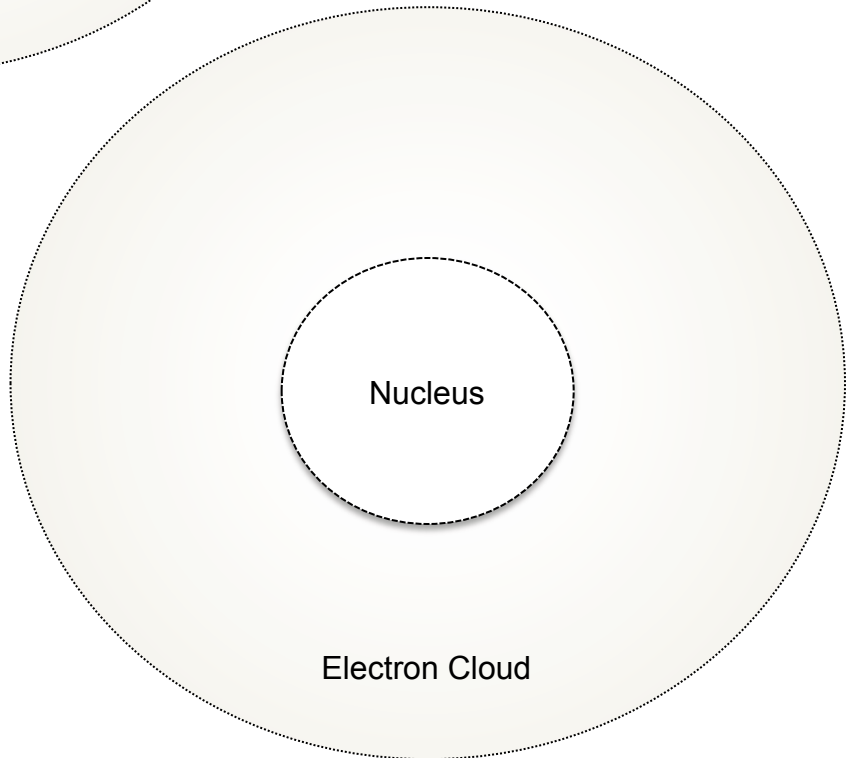
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Part II: Atom Patterns

Lithium Atom



Beryllium Atom



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Part II: Atom Patterns, continued

- Use all four atom diagrams to complete the data table: Characteristics of the First Four Elements. Use your diagrams and the information in the *Student Guide* to answer the questions. Hydrogen has been completed for you.

| Characteristics of the First Four Elements . | | | | | |
|--|------------------|----------------|--------------|------------------|----------------|
| Atom | Proton number | Neutron number | Mass of atom | Electron number | Charge of atom |
| Hydrogen | 1 p ⁺ | ---- | 1 amu | 1 e ⁻ | 0 |
| Helium | | | | | |
| Lithium | | | | | |
| Beryllium | | | | | |

- Explain why the charge is 0 (zero) for each of the four atoms that you built on the diagrams.

- Rewrite the following statement so that it is TRUE: The number of protons and neutrons for these atoms increase sequentially by one.

- Use the Periodic Table to look up the atomic numbers for the elements of hydrogen, helium, lithium, and beryllium. Complete the data table: Atomic Number and Protons and answer the follow-up question below the table.

| Atomic Number and Protons | | |
|---------------------------|---------------|-------------------|
| Element | Atomic number | Number of protons |
| Hydrogen | | |
| Helium | | |
| Lithium | | |
| Beryllium | | |

- What statement can be made about an element's atomic number and the number of protons in one atom of the element?

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Part II: Atom Patterns, continued

6. Use the trend that you see in the previous table to predict how many protons will be found in an atom of each of the following elements. Then predict the number of electrons found in a single, neutral atom of each element.

| Protons and Electrons in Atoms of Neutral Elements | | | |
|--|---------------|-------------------|---------------------|
| Atom | Atomic number | Number of protons | Number of electrons |
| Copper | 29 | | |
| Boron | 5 | | |
| Uranium | 92 | | |
| Gold | 79 | | |
| Neon | 10 | | |

7. What statement can be made about an electrically neutral atom's number of protons and electrons?

8. Look at the example, using the atoms that you built on the diagrams, then complete the rest of the data table: Total Mass from Protons and Neutrons.

| Total Mass from Protons and Neutrons | | | |
|--------------------------------------|-------------|---|--|
| Typical atom of: | Mass in amu | Number of protons contributing to the mass in the nucleus | Number of neutrons contributing to the mass in the nucleus |
| Hydrogen (H) | 1 | 1 | 0 |
| Helium (He) | 4 | 2 | 2 |
| Lithium (Li) | 7 | 3 | 4 |
| Beryllium (Be) | 9 | 4 | 5 |
| Copper (Cu) | 64 | 29 | |
| Boron (B) | 11 | | |
| (Uranium (U) | 238 | | |
| Gold (Au) | 197 | | |
| Neon (Ne) | 20 | | |

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Reflections and Conclusions

1. If we know an atom's mass in amu and we know the number of protons of the atom, can we calculate the number of neutrons that contribute to the mass? Explain.

2. Electrons have a _____ charge and are found in the area of an atom called _____.
3. The atomic number of an atom is also the number of _____ in an atom.
4. Protons have a _____ charge and are found in the area of an atom called _____.
5. _____ do not have a charge and are found in the area of an atom called _____.
6. Circle the correct word: Protons and neutrons contribute (mass or volume) to the atom.
7. Circle the correct word: Electrons contribute to an atom's (mass or volume).
8. Each proton and each neutron contribute _____ amu to an atom. Amu means _____.
9. If we know the total mass of an atom in amu, we can subtract the number of _____ to calculate the number of neutrons found in the nucleus of the atom.
10. In a neutral atom, the number of _____ is the same as the number of _____.
11. Atomic numbers for atoms _____ in increments of _____ as you move across the periodic table of elements.
12. In your own words, summarize the atom's structure in terms of subatomic particles.

13. Explain what makes one atom different from another atom.

